

Bhatt et al., U.S. Patent No. 6,178,093, teaches an information handling system with a circuit assembly having holes filled with filler material. In Figure 3 of Bhatt et al., a lower portion of the assembly is shown having a metallic foil (318) placed over a photoresist layer (322). Bhatt et al. describes the manufacturing of circuit board assemblies that include fixed components that cannot move relative to one another. According to Bhatt et al. the photoresist layer (322) is placed under the metallic foil (318) and is not completely removed. Rather, holes (332) are produced through the photoresist layer, as shown in Figure 3. Thus, in Bhatt et al. the metallic foil (318) cannot be characterized as a "suspended connection."

Bickford et al., U.S. Patent No. 5,028,983, discloses a multilevel integrated circuit packaging structure that, in Figure 19, illustrates a conventional photoresist layer (178) that is placed on a metallic layer (172) with suitable openings (182) being produced therein (see Figure 20). The openings (182) allow a plating step for making contacts (186) as described at columns 11 and 12. With reference to Figures 24-27, Bickford et al. teaches using a photoresist layer (194) placed over a metallic layer (94) that is then placed on a dielectric (100). The photoresist layer (194) protects portions of the dielectric layer (100) that are not eliminated during the following etching step. In the cases described above (Figure 19 and Figures 24-28) Bickford et al. does not teach the metallic layers extending between two movable portions after removing of the photoresist layers. Rather, according to the teachings of Bickford et al., the photoresist layers have only a protective function and not a temporary support function as does the sacrificial layer of the present invention. Applicants further note that Bickford et al. does not refer to micro-mechanisms having moving portions. Moreover, neither the metallic layer (172) nor the metallic layer (94) can be defined as a suspended connection element as those are defined by the claims of the present invention.

Turning to the claims, claim 1 is directed to a method of producing suspended elements for electrical connection between two portions of a micro-mechanism that can move relative to one another on a semiconductor wafer. As previously noted, neither Bickford et al. nor Bhatt et al., taken alone or in any combination thereof, teach or suggest producing a suspended element for electrical connection between two portions of a micro-mechanism structure.

Continuing with claim 1, the method comprises forming a layer of sacrificial material that comprises a thin film with at least one adhesive side that is applied dry to a surface of the micro-mechanism, forming electrical connection elements on the layer of sacrificial material, and removing the layer of sacrificial material beneath the electrical connection elements with the electrical connection elements suspended between the two portions of the micro-mechanism that can move relative to one another. Nowhere does the combination of Bickford et al. and Bhatt et al. teach or suggest to one of ordinary skill the temporary support function of suspended elements effected by the sacrificial layer that is then removed to leave the electrical connection elements suspended between the two portions of the micro-mechanism that can move relative to one another. Moreover, the problems addressed by both Bickford et al. and Bhatt et al. are in no way related to the problems connected with micro-mechanical elements, which is described in the introductory portion of the present application.

Even if one were to combine Bickford et al. and Bhatt et al. as the Examiner suggests, the resulting combination would not teach the formation of electrical connection elements between two movable portions of a micro-mechanism using a sacrificial layer that is removed in the manner recited in claim 1. Rather, at most these references suggest the formation of small holes, and they fall short of any teaching or suggestion of suspending electrical connection elements between movable portions of a micro-mechanism. In view of the foregoing, applicants respectfully submit that claim 1, as well as dependent claims 2-14 are clearly allowable over the references cited and applied by the Examiner.

Claim 15 is also directed to a method of producing suspended elements between two portions of a micro-mechanism that can move relative to one another on a semiconductor wafer that includes applying the adhesive side of a dry film over the micro-mechanism to immobilize the movable components without penetrating any cavities, forming electrical connection elements on the layer of sacrificial material; and removing the layer of sacrificial material beneath the electrical connection element to leave the electrical connection element suspended between the two portions of the micro-mechanism that move relative to one another. Independent claim 18 is similarly directed to a method of producing suspended elements between portions of a micro-mechanism that include forming electrical connection elements suspended between the two portions of the micro-mechanism containing components that move

relative to one another. Applicants respectfully submit that independent claims 15 and 18, as well as claims 19-24, which depend from claim 18, are allowable for the reasons why claim 1 is allowable.

In view of the foregoing, applicants submit that all of the claims remaining in this application are now in condition for allowance. In the event the Examiner finds minor informalities that can be resolved by telephone conference, the Examiner is urged to contact applicants' undersigned representative by telephone at (206) 622-4900 in order to expeditiously resolve prosecution of this application. Consequently, early and favorable action allowing these claims and passing this case to issuance is respectfully solicited.

The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version With Markings to Show Changes Made.**"

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Paragraph beginning at page 3, line 17 has been amended as follows:

The micro-actuator 4 is, for example, of the type described in the Applicant's European patent application EP0913921, ~~which is incorporated herein by reference in its entirety.~~ The micro-actuator 4 is made of polysilicon in a semiconductor chip, for example, by the method described in the above-referenced European patent application.

In the Claims:

Claims 16 and 17 have been canceled.

Claims 1, 15, and 18 have been amended as follows:

1. (Amended) A method of producing suspended elements for electrical connection between two portions of a micro-mechanism that can move relative to one another on a semiconductor wafer, the method comprising: forming a layer of sacrificial material ~~comprising~~ ~~that comprises~~ a thin film with at least one adhesive side that is applied dry to a surface of the micro-mechanism, forming electrical connection elements on the layer of sacrificial material, and removing the layer of sacrificial material beneath the electrical connection elements with the electrical connection elements suspended between the two portions of the micro-mechanism that can move relative to one another.

15. (Amended) A method of producing suspended elements between two portions of a micro-mechanism that move relative to one another on a semiconductor wafer, the method comprising:

applying the adhesive side of a dry film over the micro-mechanism on the semiconductor wafer to immobilize the moveable components without penetrating any cavities therein;

forming electrical connection elements on the layer of sacrificial material; and

removing the layer of sacrificial material beneath the electrical connection elements to leave the electrical connection elements suspended between the two portions of the micro-mechanism that move relative to one another.

18. (Amended) A method of producing suspended elements between two portions of a micro-mechanism containing components that move relative to one another on a semiconductor wafer, the method comprising:

applying the adhesive side of a dry film over the micro-mechanism on the semiconductor wafer to immobilize the moveable components without penetrating any cavities therein;

forming a mask on the dry film;

depositing, developing, and selectively removing a sacrificial layer from the mask and the dry film to form windows on the dry film;

opening the windows by selectively etching the dry film;

depositing a dielectric layer to cover the windows without penetrating any underlying cavities;

depositing a conductive layer that is attached to at least one moveable portion of the micro-mechanism; and

selectively removing the conductive layer and the dielectric layer, and removing the dry film to form electrical connection elements suspended between the two portions of the micro-mechanism containing components that move relative to one another.